

CONCEPT OF OPERATIONS
FOR
COMMAND, CONTROL AND COMMUNICATIONS
(C³)
OF THE
NATIONAL POLAR-ORBITING OPERATIONAL
ENVIRONMENTAL SATELLITE SYSTEM
(NPOESS)
PROGRAM
(C³ CONOPS)



18 October 1995

PREPARED BY:
SIGNED

Bruce H. Needham
Associate Director of Operations
NPOESS/Integrated Program Office

APPROVED BY:
SIGNED

James T. Mannen
System Program Director
NPOESS/Integrated Program Office

FOR OFFICIAL USE ONLY

CONCEPT OF OPERATIONS
for
Command, Control and Communications (C³)
of the
National Polar-orbiting Operational
Environmental Satellite System (NPOESS)
Program

[C³ CONOPS]

Executive Summary

1.0 Introduction.

The Presidential Decision Directive/NSTC-2, dated 5 May 1994, directed the Departments of Commerce (DoC) and Defense (DoD) to converge their separate polar-orbiting operational environmental satellite programs into a single integrated program. The Office of Science and Technology Policy (OSTP) Convergence Implementation Plan, dated 2 May, 1994, and language in the Memorandum of Agreement (MOA) for the National Polar-orbiting Operational Environmental Satellite System (NPOESS), dated 26 May 1995, directs both Departments to converge the operations of their current polar satellite programs “as soon as practical.”

On 1 October 1994, the Integrated Program Office (IPO) of the NPOESS was formally established and staffed. Within the IPO structure, the Associate Director of Operations (ADO) has the responsibility for NPOESS operations reporting to the NPOESS Systems Program Director (SPD). Full responsibilities of the ADO, and other offices within the IPO, and their relationships to DoC and DoD, are detailed in the MOA and the Convergence Master Plan (CMP).

2.0 Objectives.

The IPO has been tasked with the development of a C³ Concept of Operations (C³ CONOPS) for the NPOESS. This C³ CONOPS will cover not only the period of operation of the new NPOESS (circa 2004+), but also transitional periods, commencing with the transfer of operations of the DoD Defense Meteorological Satellite Program (DMSP) and NOAA POES (Polar-orbiting Operational Environment Satellite) to the IPO (circa 1997), and the flights of the METOP (Meteorological Operational) satellites by EUMETSAT (European Organisation for the Exploitation of Meteorological Satellites) commencing around the year 2000.

3.0 Phases of Convergence Operations.

The IPO has identified four (4) Phases of polar satellite operations between now and approximately 2010. [Because of uncertainties associated with exact dates of each phase, these dates are for reference only].

Phase 0.....Separate DoD-DMSP AND NOAA-POES Operations (Present to circa 1997)

Operations, control, launch, etc., of the present DMSP and NOAA POES will remain under the auspices of DoD and DoC respectively as they currently exist. No new C³ CONOPS will be implemented during this Phase, however, the ADO will work with DoD and DoC counterparts during this Phase to develop a C³ Implementation Plan leading to Phase I.

Phase ITransitional DMSP and POES Operations (Circa 1997 to 2004)

This Phase applies when the IPO is fully capable of controlling the DMSP satellites from the Suitland Satellite Operations Control Center (SOCC)¹ and continues up to the earliest possible launch of the first NPOESS (circa 2004). During this period, the IPO will be responsible for operating all DMSP and POES satellites, and providing blind-orbit support and TT&C (Telemetry, Tracking and Commanding) backup to the METOP satellites. The Suitland SOCC will be the Primary operations center for both DMSP and POES, and through its CDA (Command and Data Acquisition) stations, will provide blind orbit services and TT&C backup for EUMETSAT. A backup Satellite Operations Center will be established at Falcon AFB, Colorado, as a DMSP backup only. NOAA will continue to provide backup to the POES and METOP satellites through its CDA stations.

Phase II.....Integrated DMSP, POES and NPOESS Operations (Circa 2004 to 2010)

During this Phase, the IPO will launch and operate the new NPOESS as well as continue to operate the remaining DMSP and POES spacecraft, and will provide blind-orbit support and TT&C backup for the METOP series of spacecraft. The Suitland SOCC will be primary for DMSP, POES, NPOESS operations and METOP support. The Falcon SOC will be a backup only for DMSP and NPOESS operations and METOP support (starting with METOP-3). NOAA will continue to provide backup for POES and METOP 1 and 2 satellites through its CDA stations.

Phase III.....Final NPOESS Configuration Operations (Circa 2010 and beyond)

Phase III begins when there are no longer any operational spacecraft remaining from the DMSP and POES series, and continues for the life of the NPOESS Program. The Suitland SOCC will be primary for NPOESS, METOP, and any "residual" POES or DMSP. The backup SOC at Falcon AFB will only be capable of operating NPOESS and "residual" DMSP satellites, and providing METOP-3 support.

¹ In this document "SOCC" refers to the Suitland Satellite Operations Control Center; "SOC" and "SOCs" generically refer to both the Suitland SOCC and the Falcon AFB Satellite Operations Center (SOC).

4.0 Contents.

Attached to this Executive Summary are three (3) separate volumes of C³ CONOPS developed by the IPO for Phases I, II, and III. Details concerning each Phase are contained in each respective volume.

5.0 Clarification of Terms.

Throughout the Executive Summary and the three following volumes, reference is made to “operational” and “residual” satellites. “Operational satellites” refers to assets that continue to be operated to fulfill a substantial part of the mission. “Residual satellites”, currently referred to as “stand-by satellites” or “secondary operational satellites”, are those that continue to be maintained on orbit, but only limited amounts of useful data are obtained from that asset. The respective Satellite Control Authority (SCA) will determine which satellites fall into each of these categories.

6.0 Effective Date/Amendment/Termination.

This C³ CONOPS shall become effective when it has been delivered to the NPOESS/IPO/SPD and incorporated into the Convergence Master Plan.

The IPO will review this C³ CONOPS annually and prior to IOC and FOC for each phase. This C³ CONOPS may be amended/terminated at any time by the IPO/SPD, in coordination with appropriate agencies.

COORDINATION

SIGNED

Director of Operations,
Air Force Space Command

SIGNED

Program Director,
Defense Meteorological Satellite Program
Air Force Material Command

SIGNED

Assistant Administrator for Satellite and Information Services,
National Oceanic and Atmospheric Administration

TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
1.0 INTRODUCTION.	i
2.0 OBJECTIVES.	i
3.0 PHASES OF CONVERGENCE OPERATIONS.	ii
4.0 CONTENTS.	iii
5.0 CLARIFICATION OF TERMS.	iii
6.0 EFFECTIVE DATE/AMENDMENT/TERMINATION.	iii
VOLUME 1: C³ CONOPS FOR PHASE I - TRANSITIONAL DMSP AND NOAA POES OPERATIONS (CIRCA 1997 TO 2004)	1
1.0 INTRODUCTION.	1
2.0 SCOPE.	1
3.0 OPERATIONAL SYSTEM.	1
3.1 Space Segment.	2
3.2 C³ Segment.	2
3.2.1 Satellite Operations Centers (SOCs).	2
3.2.2 Communications Element.	2
3.2.3 Antenna Element.	2
3.2.3.1 DMSP Antenna Element.	2
3.2.3.2 POES and METOP Antenna Element.	3
3.3 User Segment.	3
3.3.1 Central Users.	3
3.3.2 Real-Time Users.	4
3.4 Initial Operational Capability (IOC).	4
3.5 Full Operational Capability (FOC).	4
4.0 OPERATIONS.	4

4.1 Operational Functions.	4
4.1.1 Satellite Command and Control.	4
4.1.2 Mission Planning.	5
4.1.3 Antenna Resource Scheduling.	5
4.1.4 Launch and Early Orbit (LEO) Operations.	5
4.1.5 Anomaly Resolution.	5
4.1.6 Data Access.	5
4.1.7 Relay of Data to Central Users.	6
4.1.8 Spacecraft and Sensor Engineering.	6
4.1.9 Threat Sensor Processing.	6
4.1.10 Operational Reporting.	6
4.2 Suitland SOCC Operations	6
4.3 Falcon AFB SOC Operations.	6
4.3.1 Standard Operations.	7
4.3.2 Additional Support Operations.	7
4.3.3 Primary Operations.	7
4.3.4 Extended Operations.	7
4.4 Primary Operations Transfer.	7
4.4.1 Suitland SOCC Failure.	7
4.4.2 Backup Augmentation.	7
4.5 SOC/CDA Command and Control Interfaces.	8
4.5.1 Satellite Control Authority (SCA).	8
4.6 User Segment Operations.	8
4.6.1 Central Users.	8
4.6.2 Real-Time Users.	8
5.0 PERSONNEL.	8
5.1 Integrated Program Office.	8
5.2 Suitland SOCC.	9
5.3 Falcon AFB SOC.	9
5.4 Training.	9
6.0 CONSTELLATION MANAGEMENT.	9
6.1 Constellation Sustainability Assessment.	9
6.2 DMSP Launch Calls.	10
6.3 POES Launch Calls.	10

7.0 SECURITY.	10
8.0 MAINTENANCE.	10
VOLUME 2: C³ CONOPS FOR PHASE II - INTEGRATED DMSP, POES, METOP AND NPOESS OPERATIONS (CIRCA 2004 TO 2010)	11
1.0 INTRODUCTION.	11
2.0 SCOPE.	11
3.0 OPERATIONAL SYSTEM.	11
3.1 Space Segment.	11
3.2 Launch Support Segment.	12
3.3 C³ Segment.	12
3.3.1 Satellite Operations Centers (SOCs).	12
3.3.2 Communications Element.	12
3.3.3 Antenna Element.	12
3.3.3.1 Command and Data Acquisition (CDA) sites.	13
3.3.3.2 Air Force Satellite Control Network (AFSCN) Remote Tracking Stations (RTS).	13
3.3.3.3 Non-United States Government (USG) Sites.	13
3.4 Interface Data Processor (IDP) Segment.	13
3.5 System Users.	14
3.5.1 Central Users.	14
3.5.2 Real-Time Users.	14
3.6 Initial Operational Capability (IOC).	14
3.7 Full Operational Capability (FOC).	14
4.0 OPERATIONS.	15
4.1 Operational Functions.	15
4.1.1 Satellite Command and Control.	15
4.1.2 Mission Planning.	15
4.1.3 Antenna Resource Scheduling.	15
4.1.4 Launch and Early Orbit (LEO) Operations.	15
4.1.5 Anomaly Resolution.	16
4.1.6 System Security.	16
4.1.6.1 NPOESS Data Access.	16
4.1.6.2 Data Denial.	16

4.1.6.3 Data Denial Implementation.	16
4.1.6.4 COMSEC Support and Sustainment.	17
4.1.7 Relay of Data to Central Users.	17
4.1.8 Spacecraft and Sensor Engineering.	17
4.1.9 Threat Sensor Processing.	17
4.2 Suitland SOCC Operations.	17
4.2.1 Standard Operations	17
4.2.2 CDA Backup Operations.	17
4.3 Falcon AFB SOC Operations.	18
4.3.1 Standard Operations.	18
4.3.2 Additional Support Operations.	18
4.3.3 Primary Operations.	18
4.3.4 Extended Operations.	18
4.4 Primary Operations Transfer.	18
4.4.1 Suitland SOCC Failure.	18
4.4.2 Backup Augmentation.	19
4.5 SOC/CDA Command and Control Interfaces.	19
4.5.1 Satellite Control Authority (SCA).	19
4.6 System User Operations.	19
4.6.1 Central Users.	19
4.6.2 Real-Time Users.	19
4.7 Operational Support to Non-USG Systems.	20
5.0 PERSONNEL.	20
5.1 Integrated Program Office.	20
5.2 Suitland SOCC.	20
5.3 Falcon AFB SOC.	20
5.4 Training.	20
6.0 CONSTELLATION MANAGEMENT.	20
6.1 Constellation Sustainability Assessment.	21
6.2 Launch Calls.	21
7.0 SECURITY.	21

8.0 MAINTENANCE.	21
VOLUME 3: C³ CONOPS FOR PHASE III - FINAL NPOESS AND METOP CONFIGURATION OPERATIONS (CIRCA 2010 AND BEYOND)	22
1.0 INTRODUCTION.	22
2.0 SCOPE.	22
3.0 OPERATIONAL SYSTEM.	22
3.1 Space Segment.	22
3.2 Launch Support Segment.	23
3.3 C³ Segment.	23
3.3.1 Satellite Operations Centers (SOCs).	23
3.3.2 Communications Element.	23
3.3.3 Antenna Element.	23
3.3.3.1 CDA sites.	23
3.3.3.2 AFSCN Remote Tracking Stations.	23
3.3.3.3 Non-United States Government (USG) Sites.	24
3.4 Interface Data Processor (IDP) Segment.	24
3.5 System Users.	24
3.5.1 Central Users.	24
3.5.2 Real-Time Users.	25
4.0 OPERATIONS.	25
4.1 Operational Functions.	25
4.1.1 Satellite Command and Control.	25
4.1.2 Mission Planning.	25
4.1.3 Antenna Resource Scheduling.	25
4.1.4 Launch and Early Orbit (LEO) Operations.	26
4.1.5 Anomaly Resolution.	26
4.1.6 System Security.	26
4.1.6.1 NPOESS Data Access.	26
4.1.6.2 Data Denial.	26
4.1.6.3 Data Denial Implementation.	26
4.1.6.4 COMSEC Support and Sustainment.	26
4.1.7 Relay of Data to Central Users.	27
4.1.8 Spacecraft and Sensor Engineering.	27
4.1.9 Threat Sensor Processing.	27

4.2 Suitland SOCC Operations.	27
4.3 Falcon AFB SOC Operations.	27
4.3.1 Standard Operations.	27
4.3.2 Additional Support Operations.	28
4.3.3 Primary Operations.	28
4.3.4 Extended Operations.	28
4.4 Primary Operations Transfer.	28
4.4.1 Suitland SOCC Failure.	28
4.4.2 Backup Augmentation.	28
4.5 SOC Command and Control Interfaces.	28
4.5.1 Satellite Control Authority (SCA).	28
4.6 System User Operations.	29
4.6.1 Central Users.	29
4.6.2 Real-Time Users.	29
4.7 Operational Support to Non-U.S. Systems.	29
5.0 PERSONNEL.	29
5.1 Integrated Program Office.	29
5.2 Suitland SOCC.	29
5.3 Falcon AFB SOC.	30
5.4 Training.	30
6.0 CONSTELLATION MANAGEMENT.	30
6.1 Constellation Sustainability Assessment.	30
6.2 Launch Calls.	30
7.0 SECURITY.	31
8.0 MAINTENANCE.	31
ACRONYM/ABBREVIATION LIST	32

Volume 1: C³ CONOPS for Phase I - Transitional DMSP and NOAA POES Operations (circa 1997 to 2004)

1.0 Introduction.

The Presidential Decision Directive/NSTC-2, dated 5 May 1994, and the tri-agency MOA, dated 26 May 1995, directed the Departments of Commerce (DoC) and Defense (DoD) to converge their separate polar-orbiting operational environmental satellite programs into a single National Polar-orbiting Operational Environmental Satellite System (NPOESS) as soon as practical, to be operated by an Integrated Program Office (IPO) under the National Oceanic and Atmospheric Administration (NOAA). The NPOESS will replace NOAA's current Polar-orbiting Operational Environmental Satellite (POES) system and DoD's Defense Meteorological Satellite Program (DMSP) with one integrated national system. The IPO will develop new spacecraft and ensure appropriate modifications are made to ground systems to satisfy the combined requirements of both agencies in accordance with the NPOESS Integrated Operational Requirements Document (IORD). Prior to the deployment of this combined satellite platform, DMSP operations will be modified and consolidated with NOAA POES operations under the IPO.

Convergence will occur in three phases. During Phase I, the IPO will operate all remaining spacecraft from the two existing polar satellite programs while continuing development of new NPOESS spacecraft. During Phase II, the IPO will operate the new NPOESS spacecraft as well as any remaining spacecraft from the existing DMSP and POES programs. Phase III begins when no operational spacecraft remain from the DMSP and POES programs and continues for the life of the NPOESS. Blind-orbit support and TT&C back-up for the EUMETSAT series of METOP satellites will commence in Phase I and continue through Phase III.

2.0 Scope.

This volume of the C³ Concept of Operations (C³ CONOPS) details how DMSP and POES will be operated and maintained during Phase I of convergence. Phase I begins when the IPO is capable of operating DMSP satellites through the Suitland Satellite Operations Control Center (SOCC). During Phase I, POES operations will be integrated with DMSP operations under the responsibility of the IPO. Late in this Phase (circa 2002), the IPO will commence provision of blind-orbit support and back-up TT&C to the EUMETSAT series of METOP Satellites in accordance with **TBD** international agreements. This volume of the C³ CONOPS (Phase I) will no longer apply once the first NPOESS spacecraft is launched.

3.0 Operational System.

Currently, DMSP and POES consist of three segments: space; command, control, and communications (C³); and user. These segments definition will not change.

3.1 Space Segment.

The space segment will consist of all on-orbit DMSP and POES satellites. Nominally this will consist of two operational DMSP satellites, two operational POES satellites and any residual satellites available. Although some services will be provided to METOP through NOAA, the METOP satellites are not considered part of the NPOESS Space Segment in Phase I. Residual satellites will be maintained on-orbit for supplemental collection capability, operational back-up, test and evaluation, etc. DMSP and POES satellites will continue to be launched based on operational need.

3.2 C³ Segment.

This segment will consist of the ground-based elements which provide all functions necessary to maintain the state of health and to recover and distribute the data collected from the space segment to central and real-time users. These elements include Satellite Operations Centers (SOCs), communication links and associated antennas.

3.2.1 Satellite Operations Centers (SOCs).

The SOCs perform the functions necessary for the operation of POES and DMSP, and support to METOP satellites. The IPO will be responsible for the full operation of DMSP and POES and back-up to METOP under the direction of the IPO's Associate Director for Operations. The IPO will conduct operations from NOAA's Satellite Operations Control Center at Suitland, MD. A backup Satellite Operations Center for DMSP operations will be located at Falcon Air Force Base (AFB), CO. The Falcon AFB SOC will be minimally manned, but fully capable of performing all C³ functions for the DMSP (except Launch and Early Orbit (LEO) support) as a backup to the Suitland SOCC. Operational C³ backup for POES will be provided by the DoC/NOAA Command and Data Acquisition (CDA) sites at Fairbanks, AK and Wallops Island, VA.

3.2.2 Communications Element.

Communication links are those elements of the C³ segment which provide the required connectivity to support command and control functions and primary data distribution services for the POES and DMSP space segments. The transitional DMSP program will continue to rely on DOMSAT and other established communication links to perform its mission. Similarly, the communications element for the POES program will not change during Phase I. Additional connectivity will be established to ensure continuous, high volume interaction between the Suitland and Falcon SOCs' DMSP computers.

3.2.3 Antenna Element.

The antenna element consists of the ground based equipment necessary to receive stored mission data and telemetry (stored and real-time), as well as transmit up-link commands throughout the program segments.

3.2.3.1 DMSP Antenna Element.

DMSP operations will utilize the Air Force Satellite Control Network (AFSCN) Remote Tracking Stations (RTS). The AFSCN is utilized by many different government satellite programs and DMSP will share time with these programs. DMSP will continue to have the same priority within the AFSCN during Phase I as it currently has under Phase 0. The AFSCN is operated and maintained separately from the POES, DMSP, and NPOESS programs. The sites below with an

asterisk are current or projected DMSP enhanced Automated Remote Tracking Stations (ARTS) and are the only ones currently capable of performing Mission Data Recovery (MDR) for DMSP. Vandenberg currently does not have this capability but will be upgraded before Fairchild Satellite Operations Center (FSOC) is closed. All sites listed below are capable of providing DMSP TT&C services.

- *Thule, Greenland
- *New Boston, NH
- *Kaena Pt, HI
- *Vandenberg AFB, CA
- Falcon AFB, CO
- Anderson AFB, Guam
- Oakhanger, United Kingdom
- Mahe, Seychelles Islands
- Diego Garcia Island, UK Indian Ocean Territory

3.2.3.2 POES and METOP Antenna Element.

POES and METOP will use the DoC/NOAA CDAs. Communication with the POES and METOP satellites is performed through the CDA sites at Fairbanks, AK and Wallops Island, VA, with a ground site at Lannion, France providing blind-orbit housekeeping (TT&C) support. In addition to providing communications and data retrieval for the POES system, the CDA sites can also perform most C³ functions in the event of data line or communications failure at the Suitland SOCC. The CDAs can provide POES backup support for the following functions: satellite command and control, mission planning, antenna scheduling, and relay of data to central users.

3.3 User Segment.

DMSP and POES users comprise those central and real-time users who receive POES and DMSP data from the space and/or C³ segments. Changes in the C³ segment during Phase I will not significantly impact these users.

3.3.1 Central Users.

Central users are those processing centers within the United States Government (USG) that receive, process, and analyze DMSP and/or POES data in combination with other data sources to generate weather, space, and environmental products. Central users during Phase I will remain as they currently exist. The central users will retain responsibility for software development and maintenance to support their processing needs. The DoD central users include: the Air Force Global Weather Central (AFGWC) at Offutt AFB, NE; the 50th Weather Squadron (50 WS), formerly the Air Force Space Forecast Center (AFSFC), at Falcon AFB, CO; the Naval Oceanographic Office (NAVOCEANO) at Bay St. Louis, MS; and the Fleet Numerical Meteorology and Oceanography Center (FNMOC) at Monterey, CA. The National Environmental Satellite, Data, and Information Service (NESDIS) is the DoC/NOAA central user and will continue to provide data from its Suitland, MD facility to U.S. and international data centers through its established interfaces.

3.3.2 Real-Time Users.

Real-Time users are those users that receive DMSP and POES data as the satellites pass over that ground station. Available real-time data transmissions from DMSP and POES include:

- DMSP Real-Time Data (RTD) and Real-Time Data Smooth (RDS).
- POES High Resolution Picture Transmission (HRPT) and Automated Picture Transmission (APT).

During Phase I, real-time users will continue to receive data as they currently do. Any pertinent changes to POES or DMSP operations that may affect real-time data users will be distributed to them via service messages (see para. 4.6.2).

3.4 Initial Operational Capability (IOC).

Phase I IOC will be attained when the IPO is able to command and control the on-orbit DMSP satellites from the Suitland SOCC. The Suitland SOCC will, in addition, continue to operate the POES satellites. During the period between Phase I IOC and FOC, the DMSP Multi-Purpose Satellite Operations Center (MPSOC) at Offutt AFB, NE, will perform DMSP functions that Suitland SOCC is not able to perform. Once the Suitland SOCC can perform all operational functions for DMSP described in paragraph 4, MPSOC, may be deactivated at the discretion of the USAF. AFSPC shall certify and document Suitland SOCC's ability to perform DMSP operations prior to Satellite Control Authority being transferred to the IPO.

3.5 Full Operational Capability (FOC).

Phase I FOC will be achieved when the Suitland and Falcon AFB SOC's are fully able and authorized (by the DoD) to perform all operational functions defined in paragraph 4 for the DMSP while the Suitland SOCC continues operational control of the POES program.

4.0 Operations.

4.1 Operational Functions.

Satellite operations, commanding, telemetry, monitoring, mission scheduling, resource scheduling, launch and early orbit operations, and anomaly resolution for both DMSP and POES will be the responsibility of the IPO. The following are the basic operational functions which will be performed in support of the DMSP/POES constellation:

4.1.1 Satellite Command and Control.

Satellite command and control consists of state of health verification, satellite navigation and orbit determination, Mission Data Recovery (MDR), and other satellite commanding necessary to operate and maintain on-orbit satellites. Satellite command and control will routinely be exercised through the Suitland SOCC. The responsibility for DMSP and POES operations can be passed to the respective backup facilities if the Suitland SOCC becomes incapable of performing its function. The IPO/ADO, in coordination with the 50th Space Wing at Falcon, may direct operational control for all or part of DMSP to be shifted to the Falcon AFB SOC for reasons both agencies feel necessary. Similarly, the IPO/ADO may direct operational control of all or part of the POES system to be transferred to the CDAs.

4.1.2 Mission Planning.

Mission planning encompasses all actions necessary to schedule, program, and manage operations for each satellite. During Phase I, the Suitland SOCC will generate and disseminate all information needed for operation of the DMSP and POES satellites. The planning functions currently performed at the MPSOC at Offutt for DMSP will be performed by the Suitland SOCC or Falcon AFB SOC, as appropriate. Schedules will be generated based on data collection and playback requirements of the central and real-time users. The IPO will establish procedures to ensure the C³ segment is responsive to users' special data and operational requirements.

4.1.3 Antenna Resource Scheduling.

The two SOCs will have the capability to interface with the AFSCN to request and obtain support for tracking and mission data recovery from the DMSP satellites. This function involves scheduling AFSCN antenna resources in support of satellite command and control and MDR. Scheduling will be accomplished by interfacing to the AFSCN Resource Scheduling Element. Suitland SOCC will continue to coordinate CDA support for POES tracking and data collection.

4.1.4 Launch and Early Orbit (LEO) Operations.

This function involves the unique satellite command, control, tracking, and anomaly resolution required when a satellite is initially deployed. The Suitland SOCC will perform LEO operations for all new POES satellites. DMSP System Program Office (SPO) personnel, IAW provisions in the MOA between the IPO and SMC/CI, will direct/manage LEO operations for new DMSP spacecraft from the Suitland SOCC. Launch Deployment Authority (LDA) will be addressed in the MOA. Resources must be carefully scheduled to avoid launch support conflicts or interruptions to C³ requirements of operational satellites. DMSP and POES spacecraft will attain operational status when the primary mission sensors are functioning nominally and mission data are being received by the central users as required. At that time, the new satellite will be turned over to control of the IPO for operations. The Falcon AFB SOC will not perform this LEO function for either satellite.

4.1.5 Anomaly Resolution.

Satellites which are experiencing unique or unusual indications require anomaly resolution. Anomaly resolution refers to the non-routine procedures necessary to return a satellite to normal status. Anomaly resolution for both DMSP & POES will normally be performed at the Suitland SOCC, however, this function can be performed from the Falcon SOC for DMSP satellites. The IPO operations staff, in conjunction with Suitland SOCC and DMSP SPO, will adapt current POES and DMSP anomaly resolution procedures for use during all phases of convergence.

4.1.6 Data Access.

Access to POES data will remain unlimited throughout the duration of this phase. Access to DMSP data, however, is restricted. Data denial is accomplished by DMSP using data encryption methods. Transmissions emanating from the DMSP satellites are encrypted to limit access to the collected data and command and control of the satellite. Data retrievals via the Spacecraft Telemetry, RTD, RDS and playback and record (PBR) transmissions can only be accomplished using the correct NSA approved cryptographic devices. DMSP data encryption capabilities will continue throughout all phases of convergence.

4.1.7 Relay of Data to Central Users.

This function involves the communication of mission payload data to central data processing facilities. These facilities then process the data for use in generating forecasts and analysis of environmental parameters. Received data and the products generated by the central users can then be transmitted to customers around the world. During Phase I, any changes to the communication of DMSP and POES data to central users will be transparent to the users. Only the command and control functions will be altered. Central users will use the new C³ structure to request data reships, change data requirements, report problems, etc. Central users that have direct access to a DMSP DOMSAT station will continue to receive DMSP mission sensor data through that path.

4.1.8 Spacecraft and Sensor Engineering.

The continuous monitoring of spacecraft systems, analysis of system status and performance, sensor calibration, and recommendation of command routines needed to maintain the spacecraft in peak health and to recover from spacecraft anomalies will be conducted at the SOC. Sensor calibration is done in close coordination with the central data processing facilities.

4.1.9 Threat Sensor Processing.

This function involves the processing of classified threat sensor information on the DMSP platform. (All threat sensor related operations are **TBD**). This does not apply to the POES satellites.

4.1.10 Operational Reporting.

All reports requested or required in regard to the health, status, and daily operations of the DMSP and/or POES satellites will become the responsibility of the IPO when the IPO assumes responsibility for daily operations of a particular constellation or satellite. The content, timing, and frequency of such reports will be mutually agreed to by the IPO and the requesting agency, and documented in memorandums of understanding or agreement.

4.2 Suitland SOCC Operations

The Suitland SOCC will be the primary SOC for POES and DMSP operations. The Suitland SOCC will be equipped to allow them to operationally control DMSP satellites. The Suitland SOCC will also be equipped to provide blind-orbit support and TT&C backup to METOP satellites in accordance with international agreements. The Suitland SOCC will operate 24 hours per day, 7 days a week. During this time the Suitland SOCC will routinely exercise primary responsibility for C³ functions for DMSP and POES.

4.3 Falcon AFB SOC Operations.

The Falcon AFB SOC will provide DMSP back-up capability and will utilize equipment and software identical to the Suitland SOCC. This equipment will allow the Falcon AFB SOC to perform the core operations of DMSP satellite command and control, MDR, mission planning, anomaly resolution, and antenna resource scheduling. The Falcon SOC will not have the mission unique equipment, software, or personnel necessary to perform launch and early orbit operations. The Falcon AFB SOC will not be able to operate POES satellites.

4.3.1 Standard Operations.

The Falcon AFB SOC will normally be staffed for operations during standard duty hours (for example Mon-Fri 0730-1630). During this time, the Falcon AFB SOC will routinely exercise its capability to perform DMSP satellite command and control, mission planning, and AFSCN resource scheduling for the DMSP to maintain proficiency in these operational functions. These proficiency operations will be pre-planned and closely coordinated with and authorized by the Suitland SOCC. Falcon AFB SOC DMSP computers will remain on-line with the Suitland SOCC at all times. The 50th SW will ensure adequate manpower support 24 hours a day for this on-line equipment.

4.3.2 Additional Support Operations.

The Falcon AFB SOC may be asked to provide additional DMSP support when launch and early orbit or anomaly resolution operations for either DMSP or POES are occurring at the Suitland SOCC. This increased support may include shadowing Suitland DMSP operations or providing increased operational support to other satellites in the DMSP constellation.

4.3.3 Primary Operations.

If primary operations for DMSP transfer to the Falcon AFB SOC, the Falcon AFB SOC will be operated 24 hours a day, 7 days a week. If the transfer occurs during normal duty hours, the Falcon AFB SOC will be fully functional within 1 hour. If the transfer occurs outside of normal duty hours, the Falcon AFB SOC will become fully functional within three hours. The 50 SW will provide the Suitland SOCC a guaranteed means to contact Falcon SOC personnel 24 hours a day.

4.3.4 Extended Operations.

The Falcon AFB SOC will have sufficient manning to perform all core operations for operational DMSP satellites for 72 hours without augmentation. If operations are expected to exceed this time, augmentees from the Suitland SOCC will deploy within 2 days to the Falcon AFB SOC. Augmentees will remain deployed until such time that the Suitland SOCC returns to functional capability. The Suitland SOCC manager or IPO Associate Director for Operations will coordinate with the commander of the 50th SW to ensure proper support for the augmentees.

4.4 Primary Operations Transfer.

Primary operations for POES and/or DMSP will transfer from the Suitland SOCC to the backup facilities in the following circumstances:

4.4.1 Suitland SOCC Failure.

If the Suitland SOCC experiences a malfunction which precludes the SOCC's ability to assure transmission of mission data to either central or real-time users, the Falcon AFB SOC will assume primary operations for DMSP and the Wallops Island CDA will assume primary operations for the POES satellites (as required) until the Suitland SOCC regains the lost or failed capability.

4.4.2 Backup Augmentation.

NOAA personnel will operate POES and DMSP satellites under the direction of the IPO/ADO. The IPO Associate Director of Operations may task personnel from Suitland to deploy to the backup SOC at Falcon AFB or the POES backup sites at the DoC/NOAA CDAs at Wallops Island, VA or Fairbanks, AK.

4.5 SOC/CDA Command and Control Interfaces.

The Suitland and Falcon SOC's will maintain a close interface with each other regarding the DMSP system. Similarly, the Suitland SOCC and the CDAs will maintain a close interface regarding the POES program. All satellite contacts performed by the Falcon AFB SOC or CDAs will be pre-planned and closely coordinated with the Suitland SOCC.

4.5.1 Satellite Control Authority (SCA).

In order to prevent any confusion concerning SCA, only one SOC or CDA will control any given satellite at one time. The IPO will govern the transfer of SCA to and from each SOC or CDA. The IPO may direct the transfer of SCA for any individual or group of satellites. Once SCA has been passed, the SOC or CDA gaining control of the satellite is responsible for all aspects of that vehicle's operation and mission. Only the SOC or CDA having SCA over a particular satellite or group of satellites may command and control those satellites. Mission planning, scheduling, data processing, etc., may be performed by another SOC or CDA in support of the SOC or CDA having SCA.

4.6 User Segment Operations.

The IPO/ADO is responsible for the effectiveness of the POES/DMSP C³ segment in providing data to the User segment. Users will report problems concerning the receipt and quality of satellite data to the IPO using an adaptation of current reporting procedures, channels, and mechanisms. The respective applicable procedures will be identified, coordinated, documented and disseminated to all users prior to the IPO assuming SCA of DMSP or POES. The IPO will take action to resolve problems as soon as possible to meet DMSP and POES Operational Availability requirements.

4.6.1 Central Users.

DoC and DoD central data processing facilities will continue to be responsible for data processing and distribution of POES and DMSP data to their respective users.

4.6.2 Real-Time Users.

Real-Time users will continue to receive data and direct-broadcast messages from DMSP and POES as they always have. The SOC will also generate and issue DMSP and POES satellite ephemeris and satellite orbital parameters to the real-time user community via conventional communications channels. Satellite ephemeris and orbital parameter messages sent via conventional communications channels will be formatted for automated data processing similar to messages currently issued by NESDIS for the POES.

5.0 Personnel.

5.1 Integrated Program Office.

As described in the NPOESS IPO Staffing Plan, the IPO will be staffed by personnel from DoC, DoD, and NASA to form a unified entity capable of managing the DMSP and POES operations and the development of the National Polar-orbiting Operational Environmental Satellite System. The IPO administrative office will normally be manned 0730 - 1700 Monday through Friday except holidays. However, appropriate IPO personnel will be on call to assist the SOC's, handle contingencies, and generally help ensure the operations of the programs under its control.

5.2 Suitland SOCC.

The Suitland SOCC will be operated by NOAA personnel 24 hours a day, 7 days a week. Sufficient personnel will be on hand for total POES and DMSP operations. The 50th SW and SMC/CI may have at least one liaison at the Suitland SOCC to support DMSP operations.

5.3 Falcon AFB SOC.

The Falcon AFB SOC will be operated by the 50th Space Wing. 50th Space Wing personnel will not be assigned to the Integrated Program Office (IPO), but will serve the IPO as its operational customer in accordance with the Memorandum of Agreement between the IPO and the 50th Space Wing. The IPO may assign/detail one or more IPO representatives (liaisons) to Falcon AFB SOC.

5.4 Training.

The Air Force and NOAA will use similar training procedures for their respective personnel. The IPO will ensure all personnel are provided the same level of initial training. Initial training will be conducted in accordance with the appropriate Implementation Plan and Memorandum of Agreement. Operations personnel will become qualified to control DMSP satellites from both SOCs. Individuals will be selected from each SOC and trained to perform contingency functions (Falcon AFB SOC augmentation, national contingency operations, CDA augmentation) at other facilities. The Suitland SOCC will also ensure all Suitland SOCC/CDA personnel are provided training for POES operations.

6.0 Constellation Management.

Constellation management involves managing the health and status of the entire DMSP/POES constellation. The DoD and DoC will jointly share responsibility for constellation management of DMSP and POES via the IPO/ADO. Conflicts will be resolved by the IPO/SPD.

6.1 Constellation Sustainability Assessment.

The IPO's Associate Director for Operations will review POES/DMSP constellation status on a continuous basis and report such to the IPO/SPD on a weekly basis (or more often when necessary). DMSP operational status, launch requirements, and launch readiness will be coordinated with US Space Command (USSPACECOM), Air Force Headquarters (HQ/USAF), Air Force Space Command (AFSPC), 14th Air Force, Air Force Space and Missile Systems Center (SMC), and Air Weather Service (AWS). POES operational status, launch requirements and launch readiness information will be coordinated with the National Weather Service (NWS), the National Environmental Satellite, Data and Information Service (NESDIS), the NOAA POES System Acquisition Office (SAO), and the NASA METSAT Project.

All aforementioned agencies will be responsible for informing the IPO/ADO of all changes in DMSP or POES status, launch requirements and launch readiness. Based on this information, the IPO will provide all launch call recommendations as needed and a projection of future launches. Factors used to determine these projections and recommendations include, but are not limited to: sensor health status on each satellite, launch pad availability, launch vehicle assembly and checkout status, satellite processing facility availability, commercial launch agreements, launch support conflicts, and world political environment. The IPO/SPD will advise the Air Weather Service through the AFSPC, to request a DMSP launch and/or the NASA METSAT Project

Office for a POES launch. Launch requests will include a 15 day launch window, nodal crossing time, and mission sensor complement.

6.2 DMSP Launch Calls.

Launch call procedures for the DMSP satellites will continue as they are presently. Following a launch request from AWS, DMSP launch calls will be issued by USSPACECOM. Launch calls will direct the launch support segment and launch facilities to prepare the DMSP vehicle for launch as negotiated with Air Weather Service. Launch calls will be made on an as-needed (on-demand) basis. Normally a DMSP launch will be scheduled to occur as soon as possible after the launch call, unless mitigating factors are considered sufficient enough to warrant a delay, or expedite the launch.

6.3 POES Launch Calls.

Launch call procedures for the POES satellites will continue as they are presently. Upon failure of a mission critical sensor, or other major anomaly, the need for a POES launch will be coordinated between the NWS, NESDIS, and the NOAA POES SAO. They will then request that NASA deliver a POES spacecraft to the launch facility in coordination with the launching agency. Normally, a POES launch will be scheduled to occur within 120 days of the launch call unless mitigating factors are considered sufficient enough to warrant a delay or speed up the launch.

7.0 Security.

Systems and procedures will be developed to prevent the disclosure of mission plans, status, and information in accordance with established security guidelines. Security at the Suitland SOCC will follow DoC/NOAA security standards commensurate with that level necessary for DMSP and POES operations, equipment installed, classified materials present, etc. Security at the Falcon AFB SOC will follow DoD security procedures sufficient to meet the established requirements.

8.0 Maintenance.

C³ hardware and software maintenance procedures will be consistent with those detailed in the DMSP Operations Transfer Implementation Plan. Maintenance for equipment or software owned or operated by an agency supporting DMSP or POES prior to Phase I IOC will continue to be funded through their current sources. Maintenance for any new acquisitions to support DMSP or POES will be funded through the IPO. Similar equipment at each SOC will be maintained under the same contract. Documentation will be created and maintained to ensure configuration management of hardware and software. AFSCN sites will be maintained separately under existing USAF contracts.

Volume 2: C³ CONOPS for Phase II - Integrated DMSP, POES, METOP and NPOESS Operations (circa 2004 to 2010)

1.0 Introduction.

The Presidential Decision Directive/NSTC-2, dated 5 May 1994, directed the Departments of Commerce (DoC) and Defense (DoD) to converge their separate polar-orbiting operational environmental satellite programs into a single National Polar-orbiting Operational Environmental Satellite System (NPOESS) to be operated by an Integrated Program Office (IPO) under the National Oceanic and Atmospheric Administration (NOAA). The NPOESS will replace NOAA's current Polar-orbiting Operational Environment Satellite (POES) system and DoD's Defense Meteorological Satellite Program (DMSP) with one integrated national system. The IPO will develop new spacecraft and ensure appropriate modifications are made to ground systems to satisfy the combined requirements of both agencies in accordance with the NPOESS Integrated Operational Requirements Document (IORD). Prior to the deployment of this combined satellite platform, DMSP operations will be modified and consolidated with NOAA POES operations under the IPO.

Convergence will occur in three phases. During Phase I, the IPO will operate all remaining spacecraft from the two existing polar satellite programs while continuing development of new NPOESS spacecraft. During Phase II, the IPO will operate the new NPOESS spacecraft as well as any remaining spacecraft from the existing DMSP and POES programs. Phase III begins when no operational spacecraft remain from the DMSP and POES programs and continues for the life of the NPOESS. Blind-orbit support and TT&C backup for the EUMETSAT series of METOP satellites will commence in Phase I and continue through Phase III.

2.0 Scope.

This volume of the C³ Concept of Operations (C³ CONOPS) details how DMSP, POES, and NPOESS will be operated and maintained during Phase II of convergence and the roles and responsibilities of the IPO for METOP support. This C³ CONOPS is applicable following the launch of the first NPOESS satellite until the last POES and DMSP have ceased operational support. This C³ CONOPS for Phase II will supersede the C³ CONOPS for Phase I. This volume of the C³ CONOPS (Phase II) will no longer apply once all POES and DMSP satellites cease full operational support.

3.0 Operational System.

The NPOESS Program will consist of four segments: space; launch support; command, control, and communications (C³); and interface data processor (IDP). Currently, the DMSP and POES consist of three segments: space; command, control, and communications (C³); and user. These differences do not significantly change the C³ operations of the three programs.

3.1 Space Segment.

The space segment will consist of all on-orbit POES, DMSP, NPOESS, and METOP satellites. The METOP (Meteorological Operational) satellites are operated by the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). The nominal on-orbit configuration of NPOESS/METOP consists of three operational satellites in sun-synchronous polar orbits with nodal crossing times of 0530 (descending NPOESS), 0930 (descending METOP), and 1330 (ascending NPOESS) plus any residual satellites. Residual satellites will be

maintained on-orbit for supplemental collection capability, operational back-up, test and evaluation, etc. Remaining DMSP satellites will be placed in the 0530 and 0930 orbits while the remaining POES satellites will meet the 1330 mission. All remaining DMSP and POES satellites, and all NPOESS and METOP satellites will be launched on an as-needed basis.

3.2 Launch Support Segment.

The launch support segment will consist of all facilities and equipment necessary to launch NPOESS satellites with the exception of the booster.

3.3 C³ Segment.

This segment will consist of the ground-based elements which provide all functions necessary to maintain the state of health and to recover and distribute the data collected from the space segment. These elements include Satellite Operations Centers (SOCs), communication links and associated antennas.

3.3.1 Satellite Operations Centers (SOCs).

The SOC's perform the functions necessary for the operation of DMSP, POES, METOP, and NPOESS. The primary Satellite Operations Center will be located at Suitland, MD for POES, DMSP and NPOESS. A backup Satellite Operations Center will be located at Falcon Air Force Base (AFB), CO for DMSP and NPOESS. The Falcon AFB SOC will be minimally manned but fully capable of performing all C³ functions (except Launch and Early Orbit (LEO) support) for the DMSP and NPOESS as a backup to the Suitland SOCC. Primary C³ functions for the METOP mission will be performed by EUMETSAT from their SOC in Europe. Support for METOP will be provided by the Suitland SOCC. The DoC/NOAA Command Data Acquisition sites will provide C³ operational back-up for the remaining POES satellites.

3.3.2 Communications Element.

Communication links are those elements of the C³ segment which provide the required connectivity to support command and control functions and primary data distribution services for all aspects of the DMSP, POES, NPOESS, and METOP programs. Previously established communications links will continue to provide communications support for the elements of DMSP and POES. The NPOESS will use **TBD** circuits for communications support. Data exchanges with EUMETSAT and the METOP spacecraft will be conducted via **TBD** circuits.

3.3.3 Antenna Element.

The antenna element consists of the ground based equipment necessary to receive mission data and telemetry, and transmit up-link commands within and between the NPOESS segments. DoC/NOAA Command Data Acquisition (CDA) sites and Air Force Satellite Control Network (AFSCN) Remote Tracking Stations (RTS) will be used to communicate with the NPOESS. Residual DMSP/POES satellites will continue to use AFSCN and CDA sites respectively. Primary communications with the METOP satellites will be performed through European antenna sites. The CDA sites will be used to communicate with the METOP (1 and 2) satellites in accordance with the international memorandum of agreement between the IPO and EUMETSAT.

3.3.3.1 Command and Data Acquisition (CDA) sites.

Communications with the POES, NPOESS, and METOP satellites are performed through the CDA sites at Fairbanks, AK and Wallops Island, VA (POES blind-orbit TT&C support will continue to be obtained from Lannion, France). It is yet to be determined which antenna sites will be capable of performing NPOESS Mission Data Recovery (MDR). Additionally, the CDA sites can also perform most C³ functions for the POES spacecraft in the event of a failure at the Suitland SOCC. The CDAs can provide backup support for the following functions: satellite command and control, mission planning, antenna scheduling, and relay of data to central users.

3.3.3.2 Air Force Satellite Control Network (AFSCN) Remote Tracking Stations (RTS).

The AFSCN is utilized by many different government satellite programs. DMSP and NPOESS will share time with these programs. DMSP and NPOESS satellites will have the same priority within the AFSCN during Phase II as DMSP has under Phases 0 and I. The AFSCN will be operated and maintained separately from the DMSP, NPOESS, and POES programs. The sites below with an asterisk are current and/or projected DMSP enhanced Automated Remote Tracking Stations (ARTS) and are the only ones expected to be capable of performing MDR for DMSP. All sites listed below are capable of providing DMSP TT&C services. AFSCN sites to be used for NPOESS MDR will be dependent on users' MDR requirements.

- *Thule, Greenland
- *New Boston, NH
- *Kaena Pt, HI
- *Vandenberg AFB, CA
- Falcon AFB, CO
- Anderson AFB, Guam
- Oakhanger, United Kingdom
- Mahe, Seychelles Islands
- Diego Garcia Island, UK Indian Ocean Territory

3.3.3.3 Non-United States Government (USG) Sites.

The following non-USG site(s) may be used:

- TBD** - Tromso, Norway
- TBD** - Kiruna, Sweden

These tracking stations will provide primary communication support with the METOP satellites but may also be used to supplement USG assets. Non-USG sites will not be critical for USG portions of NPOESS performance. NPOESS must meet system requirements without their support.

3.4 Interface Data Processor (IDP) Segment.

This segment is comprised of data processing equipment at the Central and real-time user sites that are considered part of the NPOESS. The function of the IDP is to transform raw satellite data into IORD defined Environmental Data Records prior to delivery to users.

3.5 System Users.

Providing data to the users is the mission of the IPO. Customer service will take a very high priority. The integrated program supports two general types of users: the central users and the real-time users.

3.5.1 Central Users.

Central users are those processing centers within the USG that receive, process, and analyze DMSP, POES, NPOESS and/or METOP satellite data in combination with other data sources to generate weather, space, and environmental products. During phases II and III central users will remain as they currently exist. The DoD central users include: the Air Force Global Weather Central (AFGWC) at Offutt AFB, NE; the 50th Weather Squadron (50 WS), formerly the Air Force Space Forecast Center (AFSFC), at Falcon AFB, CO; the Naval Oceanographic Office (NAVOCEANO) at Bay St. Louis, MS; and the Fleet Numerical Meteorology and Oceanography Center (FNMOC) at Monterey, CA. The National Environmental Satellite, Data and Information Service (NESDIS) will continue to provide data from its Suitland, MD facility to U.S. and international data centers through its established interfaces.

3.5.2 Real-Time Users.

Real-Time users are those users that receive DMSP, POES, NPOESS and/or METOP data as the satellites pass over that ground station. Available real-time data transmissions will include:

- DMSP Real-Time Data (RTD) and Real-Time Data Smooth (RDS)
- POES High Resolution Picture Transmission (HRPT) and Automated Picture Transmission (APT)
- NPOESS HRPT and Low Resolution Picture Transmission (LRPT)
- METOP HRPT and LRPT.

3.6 Initial Operational Capability (IOC).

Phase II IOC will be attained when the following conditions are met:

- The first NPOESS spacecraft has been launched and declared operational; and,
- The Suitland and Falcon AFB SOC's are able and authorized to perform all operational functions defined in paragraph 4 for the DMSP, POES, (METOP TBD), and NPOESS spacecraft.

3.7 Full Operational Capability (FOC).

Phase II FOC will be achieved when the following conditions are met:

- The second NPOESS spacecraft has been launched and declared operational; and,
- The Suitland and Falcon AFB SOC's are able and authorized to perform all operational functions defined in paragraph 4.0 for the DMSP, POES, (METOP TBD), and NPOESS spacecraft.

4.0 Operations.

4.1 Operational Functions.

Satellite operations, commanding, telemetry monitoring, mission scheduling, resource scheduling, launch and early orbit operations, and anomaly resolution for the DMSP, POES, and NPOESS systems will be performed by the IPO. During Phase II, these functions will be primarily performed at the Suitland SOCC. The Falcon AFB SOC will be capable of performing mission planning for DMSP and NPOESS while exercising back-up operations. The DoC/NOAA CDA sites will perform operational back-up for the remaining POES satellites. Operations functions for METOP are **TBD** but will include blind-orbit support and TT&C back-up. The following are the basic operational functions to be performed:

4.1.1 Satellite Command and Control.

Satellite command and control consists of state of health verification, satellite navigation and orbit determination, Mission Data Recovery (MDR), and other satellite commanding necessary to operate and maintain on-orbit satellites. Satellite command and control will routinely be exercised through the Suitland SOCC. The responsibility for DMSP, POES, and NPOESS operations can be passed to the respective backup facilities if the Suitland SOCC becomes incapable of performing its function. The IPO/ADO, in coordination with the 50th Space Wing at Falcon, may direct operational control for all or part of DMSP or NPOESS to be shifted to the Falcon AFB SOC for reasons both agencies feel necessary. Similarly, the IPO/ADO may direct operational control of all or part of the POES system to be transferred to the CDAs. Support for the METOP satellites may also be transferred to the CDAs in accordance with the Memorandum of Agreement between the IPO and the EUMETSAT.

4.1.2 Mission Planning.

Mission planning encompasses all actions necessary to schedule, program, and manage operations for each satellite. During Phase II, the Suitland SOCC will generate and disseminate all information needed for operation of the satellites. Schedules will be generated based on data collection and playback requirements of the central and real-time users. The IPO will establish procedures to ensure the C³ segment is responsive to users' special data and operational requirements. Mission planning files and programs will be transferred to the mission planning system at the back-up SOC as required to maintain a complete redundant capability.

4.1.3 Antenna Resource Scheduling.

The two SOC's will have the capability to interface with the AFSCN and CDAs to request and obtain support for tracking and MDR from the DMSP and NPOESS satellites. This function involves scheduling AFSCN and CDA antenna resources in support of satellite command and control and MDR. This will be done via interfacing to the AFSCN Resource Scheduling Element and the Suitland and Falcon AFB SOC's. The Suitland SOCC will coordinate CDA support for POES and NPOESS tracking and MDR. Support from non-USG antenna sites will be scheduled through **TBD**.

4.1.4 Launch and Early Orbit (LEO) Operations.

This function involves the unique satellite command, control, tracking, and anomaly resolution required when a satellite is initially deployed. LEO operations for the POES, DMSP and

NPOESS satellites will be performed at the Suitland SOCC. DMSP SPO personnel, IAW provisions in the MOA between the IPO and SMC/CI, will direct/manage LEO operations for new DMSP spacecraft from the Suitland SOCC. Launch Deployment Authority (LDA) will be addressed in the MOA. Resources must be carefully scheduled to avoid launch support conflicts or interruptions to C³ requirements of other operational satellites. NPOESS, DMSP, and POES spacecraft will attain operational status when the primary mission sensors are functioning nominally and mission data are being received by the Central users as required. At that time, the new satellite will be turned over to control of the IPO for operations. If the Suitland SOCC experiences a failure, control of operational satellites will be transferred to the back-up sites. LEO operations will be postponed until capability has been restored at Suitland.

4.1.5 Anomaly Resolution.

Satellites which are experiencing unique or unusual indications require anomaly resolution. Anomaly resolution refers to the non-routine procedures necessary to return a satellite to normal status. The IPO operations staff in conjunction with the SOCs, and DMSP System Program Office (SPO) will adapt current POES and DMSP anomaly resolution procedures for use during all phases of convergence. Additionally, they will work closely with IPO and contractor's system engineers to develop anomaly resolution procedures for the NPOESS spacecraft.

4.1.6 System Security.

All command and control transmissions from the POES, DMSP, and NPOESS ground systems will be encrypted to ensure only authorized parties can access the system.

4.1.6.1 NPOESS Data Access.

Ordinarily, the NPOESS satellites will transmit mission data to Central and real-time users without encryption. The NPOESS data encryption system will be designed to eliminate unnecessary redundancy and ensure only authorized users have access during periods of data denial.

4.1.6.2 Data Denial.

This function involves the transmittal of commands to the satellites to control/limit the access of data to unauthorized users. During Phase II, the IPO/ADO will be responsible for implementing the DMSP and NPOESS data denial capabilities. Data from the POES satellites will not be subject to data denial operations. Procedures will be developed to maintain the widest possible data distribution while exercising data denial operations to meet national security needs. The IPO will be the Controlling Authority responsible for validating user requests and authorizing distribution of COMSEC equipment, key material, and COMSEC aids to end users.

4.1.6.3 Data Denial Implementation.

The Memorandum of Agreement between the DoC, DoD, and NASA, as implemented by the NPOESS Operations Plan, describes NPOESS data denial policy and procedures. DoD may request NPOESS data denial for national security purposes in consultation with DoC and Department of State (DoS).

4.1.6.4 COMSEC Support and Sustainment.

The Air Force Director of Cryptologic Management at Kelly AFB, TX will provide hardware logistics support for all ground COMSEC equipment and key management for COMSEC Material and COMSEC Aids to the NPOESS program, as established in MOA TBD.

4.1.7 Relay of Data to Central Users.

This function involves the communication of mission payload data to central data processing facilities. These facilities then process the data for use in generating forecasts and analysis of environmental parameters. Received data and the products generated by the Central users can then be transmitted to customers around the world. Each SOC will be able to retrieve data from all suitably equipped CDA and AFSCN sites. The controlling SOC will ensure these data are delivered to meet all requirements of the central users. Central users will use the converged C³ structure to request data reshops, change data requirements, report problems, etc. Central users that have direct access to a DMSP DOMSAT station will continue to receive DMSP mission sensor data through that path.

4.1.8 Spacecraft and Sensor Engineering.

The continuous monitoring of spacecraft systems, analysis of system status and performance, sensor calibration, and recommendation of command routines needed to maintain the spacecraft in peak health and to recover from spacecraft anomalies will be conducted at the SOC. Sensor calibration is done in close coordination with the central data processing facilities.

4.1.9 Threat Sensor Processing.

This function involves the processing of classified threat sensor information on the DMSP and NPOESS platforms. (Final plans concerning these sensors have not yet been made.)

4.2 Suitland SOCC Operations.

The Suitland SOCC will be the primary SOC for NPOESS operations including DMSP and POES. All aspects of the polar program, to include personnel and equipment, at the Suitland SOCC will be managed by the IPO. The Suitland SOCC will also be equipped to provide blind-orbit support and TT&C backup to METOP satellites in accordance with international agreements.

4.2.1 Standard Operations

The Suitland SOCC will operate 24 hours a day, 7 days a week. During this time the Suitland SOCC will routinely exercise primary responsibility for C³ functions for NPOESS, POES and DMSP.

4.2.2 CDA Backup Operations.

The CDAs will provide hot backup support to the Suitland SOCC for the POES satellites in the event of short-term communications outages or computer problems. The CDAs will shadow Suitland SOCC operations during spacecraft contacts, running schedules in synchronization with the Suitland SOCC, and are fully capable of assuming command and control functions of the POES satellites in real-time.

4.3 Falcon AFB SOC Operations.

The Falcon AFB SOC will provide NPOESS and DMSP back-up capability and will utilize equipment and software identical to the Suitland SOCC. This equipment will allow the Falcon AFB SOC to perform the core operations of NPOESS and DMSP satellite command and control, MDR, mission planning, anomaly resolution, and antenna resource scheduling. The Falcon AFB SOC will not be able to operate POES satellites.

4.3.1 Standard Operations.

The Falcon AFB SOC will normally be staffed for operations during standard duty hours (for example Mon-Fri, 0730-1630). During this time the Falcon AFB SOC will routinely exercise its capability to perform satellite command and control, mission planning, and AFSCN resource scheduling for the DMSP and NPOESS to maintain proficiency in these operational functions. These proficiency operations will be pre-planned and closely coordinated with the Suitland SOCC. Falcon AFB SOC DMSP and NPOESS computers will remain on-line with the Suitland SOCC at all times. The 50th SW will ensure adequate manpower support 24 hours a day for this equipment.

4.3.2 Additional Support Operations.

The Falcon AFB SOC may provide additional support when launch and early orbit and anomaly resolution operations are occurring at the Suitland SOCC. This increased support could include shadowing Suitland operations or providing increased operational support to other satellites in the NPOESS or DMSP constellations.

4.3.3 Primary Operations.

If primary operations for NPOESS and/or DMSP transfers to the Falcon AFB SOC, the Falcon AFB SOC will be operated 24 hours a day. If the transfer occurs during normal duty hours the Falcon AFB SOC will be fully functional within 1 hour. If the transfer occurs outside of normal duty hours the Falcon AFB SOC will become fully functional within three hours. The 50 SW will provide the Suitland SOCC a guaranteed means to contact Falcon SOC personnel 24 hours a day.

4.3.4 Extended Operations.

The Falcon AFB SOC will have sufficient manning to perform all core operations for operational NPOESS and DMSP satellites for 72 hours without augmentation. If the delay is expected to exceed this time, augmentees from the Suitland SOCC will deploy within 2 days to the Falcon AFB SOC. Augmentees will remain deployed until such time that the Suitland SOCC returns to functional capability. The Suitland SOCC manager or IPO Associate Director for Operations will coordinate with the commander of the 50th SW to ensure proper support for the augmentees.

4.4 Primary Operations Transfer.

Primary operations for NPOESS, POES, or DMSP will transfer from the Suitland SOCC to the backup facility in the following circumstances:

4.4.1 Suitland SOCC Failure.

If the Suitland SOCC experiences a malfunction which precludes the SOCC's ability to assure transmission of mission data to either central or real-time users, the Falcon AFB SOC will assume primary operations for NPOESS and DMSP and the Wallops Island CDA will assume primary

operations for the POES satellites (as required) until the Suitland SOCC regains the lost or failed capability.

4.4.2 Backup Augmentation.

NOAA personnel will continue to perform the primary functions for NPOESS, POES, and DMSP control under the direction of the IPO/ADO. The IPO Associate Director of Operations may task personnel from Suitland to deploy to the backup SOC at Falcon AFB or the POES backup sites at the DoC/NOAA CDAs at Wallops Island, VA or Fairbanks, AK.

4.5 SOC/CDA Command and Control Interfaces.

The Suitland and Falcon SOCs will maintain a close interface with each other regarding the NPOESS and DMSP systems. Similarly, the Suitland SOCC and the CDAs will maintain a close interface regarding the POES and NPOESS programs. All satellite contacts performed by the Falcon AFB SOC or CDAs will be pre-planned and closely coordinated with the Suitland SOCC.

4.5.1 Satellite Control Authority (SCA).

In order to prevent any confusion concerning SCA, only one SOC or CDA will control any given satellite at one time. The IPO will govern the transfer of SCA to and from each SOC or CDA. The IPO may direct the transfer of SCA for any individual or group of satellites. Once SCA has been passed, the SOC or CDA gaining control of the satellite is responsible for all aspects of that vehicle's operation and mission. Only the SOC and CDA having SCA over a particular satellite or group of satellites may command and control those satellites. Mission planning, scheduling, data processing, etc., may be performed by another SOC or CDA in support of the SOC or CDA having SCA.

4.6 System User Operations.

The IPO/ADO will be responsible for the effectiveness of the C³ segment in providing data to the system users. Users will report problems concerning the receipt and quality of satellite data to the IPO using an adaptation of current reporting procedures, channels, and mechanisms. New procedures for NPOESS will be identified, coordinated, documented and disseminated to all users prior to the first NPOESS launch. The IPO will take action to resolve problems as soon as possible to meet Operational Availability requirements.

4.6.1 Central Users.

DoD and DoC central data processing facilities will be responsible for data processing and distribution of satellite data to their respective users. The IPO/ADO will supply the necessary on-site equipment and support (Interface Data Processing Segment) to deliver data to the central users in the appropriate formats.

4.6.2 Real-Time Users.

Real-Time users will be able to receive data and direct-broadcast messages from all operational satellites in the NPOESS, POES, DMSP and METOP constellations provided they have compatible receiving and processing equipment, cryptographic equipment (for DMSP, METOP TBD, and NPOESS only), schedules or ephemeris, and communications frequencies. The SOC will also generate and issue satellite ephemeris and satellite orbital parameters to the real-time user community via conventional communications channels. Satellite ephemeris and orbital parameters

messages sent via conventional communications channels will be formatted for automated data processing similar to messages currently issued by NESDIS for the POES.

4.7 Operational Support to Non-USG Systems.

The NPOESS will support and fulfill agreements with other countries. Support to EUMETSAT will consist of TT&C and blind orbit support to their METOP spacecraft. Additionally, EUMETSAT and the NPOESS IPO will arrange to share mission data in near real-time in accordance with international memorandum of agreements.

5.0 Personnel.

5.1 Integrated Program Office.

As described in the NPOESS IPO Staffing Plan, the IPO will be staffed by personnel from DoC, DoD, and NASA to form a unified entity capable of managing the NPOESS, DMSP, and POES programs. Normal business hours for the IPO administrative office will be 0730 - 1700 Monday through Friday except holidays. However, appropriate IPO personnel will be on call to assist the SOCs, handle contingencies, and generally help ensure the operations of the programs under its control.

5.2 Suitland SOCC.

The Suitland SOCC will be operated by NOAA personnel 24 hours a day, 7 days a week. Sufficient personnel will be on hand for total POES, DMSP and NPOESS operations. The 50th SW and SMC/CI may have at least one liaison representative at the Suitland SOCC to support DMSP and/or NPOESS operations..

5.3 Falcon AFB SOC.

The Falcon AFB SOC will be operated by the 50th Space Wing (SW). 50th SW personnel will not be assigned to the Integrated Program Office (IPO), but will serve the IPO as its operational customer in accordance with the Memorandum of Agreement between the IPO and the 50th Space Wing. The IPO may assign/detail one or more IPO representatives (liaisons) to the Falcon AFB SOC.

5.4 Training.

The Air Force and NOAA will use similar training procedures for their respective personnel. The IPO will ensure all personnel are provided the same level of initial training. Initial training will be conducted in accordance with the appropriate Implementation Plan and Memorandum of Agreement. Operations personnel will become qualified to control DMSP and NPOESS satellites from both SOCs. Individuals will be selected from each SOC and trained to perform contingency functions (Falcon AFB SOC augmentation, national contingency operations, CDA augmentation) at other facilities. The Suitland SOCC will also ensure all Suitland SOCC/CDA personnel are provided training for POES operations.

6.0 Constellation Management.

Constellation management involves managing the health and status of the entire NPOESS, DMSP, and POES constellation. The DoC and DoD will jointly share responsibility for constellation management of DMSP, POES, and NPOESS via the IPO/ADO. Conflicts will be resolved by the IPO/SPD.

6.1 Constellation Sustainability Assessment.

The IPO's Associate Director for Operations will review NPOESS, POES, METOP and DMSP constellation status on a continuous basis, and report such to the IPO/SPD on a weekly basis (or more often when necessary). Operational status, launch requirements, and launch readiness will be coordinated with US Space Command (USSPACECOM), Air Force Headquarters (HQ/USAF), the 14th AF, the National Weather Service (NWS), Air Weather Service (AWS), Air Force Space Command (AFSPC), the NOAA POES System Acquisition Office (SAO), Air Force Space and Missile Systems Center (SMC), the National Environmental Satellite, Data and Information Service (NESDIS), and the NASA METSAT Project. All aforementioned agencies will be responsible for informing the IPO/ADO of changes in NPOESS, DMSP, or POES status, launch requirements and launch readiness. The IPO/ADO and EUMETSAT will coordinate all activities and decisions relevant to METOP operations and planning. Based on this information, the IPO will provide NPOESS launch call recommendations and projections of future launches. Factors used to determine these projections and recommendations include, but are not limited to: sensor health status on each satellite, launch pad availability, launch vehicle assembly and checkout status, satellite processing facility availability, commercial launch agreements, launch support conflicts, and world political environment. Based on information from the IPO/SPD, the Senior User Advisory Group (SUAG) may request a launch through the AFSPC. Launch requests will include a 15 day launch window, nodal crossing time, and mission sensor complement. Launch requests will be thoroughly coordinated with all key agencies.

6.2 Launch Calls.

Following the launch requests from the SUAG, USSPACECOM will issue all launch calls. They will direct the launch support segment, and launch facilities to prepare the vehicle for launch as negotiated with the IPO/ADO. Launch calls will be made on an as-needed (on-demand) basis. Normally an NPOESS launch will be scheduled to occur within 60 days of the launch call unless mitigating factors are considered sufficient enough to warrant the delay, or expedite the launch.

7.0 Security.

Systems and procedures will be developed to prevent the disclosure of mission plans, status, and information in accordance with established security guidelines. Security at the Suitland SOCC will follow DoC/NOAA security standards commensurate with that level necessary for NPOESS operations, equipment installed, classified materials present, etc. Security at the Falcon AFB SOC will follow DoD security procedures sufficient to meet the established requirements.

8.0 Maintenance.

C³ hardware and software maintenance procedures will be consistent with those detailed in the DMSP Operations Transfer and/or NPOESS Implementation Plan. Maintenance for equipment or software owned or operated by an agency supporting DMSP or POES prior to Phase I IOC will continue to be funded through their current sources. Maintenance for any new acquisitions to support NPOESS, DMSP, or POES will be funded through the IPO. Similar equipment at each SOC will be maintained under the same contract. Documentation will be created and maintained to ensure configuration management of hardware and software. AFSCN sites will be maintained separately under existing USAF contracts.

Volume 3: C³ CONOPS for Phase III - Final NPOESS and METOP Configuration Operations (Circa 2010 and beyond)

1.0 Introduction.

The Presidential Decision Directive/NSTC-2, dated 5 May 1994, directed the Departments of Commerce (DoC) and Defense (DoD) to converge their separate polar-orbiting operational environmental satellite programs into a single National Polar-orbiting Operational Environmental Satellite System (NPOESS) to be operated by an Integrated Program Office (IPO) under the National Oceanic and Atmospheric Administration (NOAA). The NPOESS will replace NOAA's current Polar-orbiting Operational Environment Satellite (POES) system and DoD's Defense Meteorological Satellite Program (DMSP) with one integrated national system. The IPO will develop new spacecraft and ensure appropriate modifications are made to ground systems to satisfy the combined requirements of both agencies in accordance with the NPOESS Integrated Operational Requirements Document (IORD). Prior to the deployment of this combined satellite platform, DMSP operations will be modified and consolidated with NOAA POES operations under the IPO.

Convergence will occur in three phases. During Phase I, the IPO will operate all remaining spacecraft from the two existing polar satellite programs while continuing development of new NPOESS spacecraft. During Phase II, the IPO will operate the new NPOESS spacecraft as well as any remaining spacecraft from the existing DMSP and POES programs. Phase III begins when no operational spacecraft remain from the DMSP and POES programs and continues for the life of the NPOESS. Blind-orbit support and TT&C backup to the EUMETSAT series of METOP satellites will commence in Phase I and continue through Phase III.

2.0 Scope.

This volume of the C³ Concept of Operations (C³ CONOPS) details how the final NPOESS configuration will be operated and maintained during Phase III of convergence (including applicable portions of METOP). This volume of the C³ CONOPS is applicable after the last POES and DMSP satellites have ceased full operational support.

3.0 Operational System.

The NPOESS program will consist of four segments: space; launch support; command, control, and communications (C³); and interface data processor.

3.1 Space Segment.

The operational space segment will consist of all on-orbit NPOESS and METOP satellites. The METOP (Meteorological Operational) satellites are operated by the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT). The nominal on-orbit configuration for NPOESS and METOP consists of three operational satellites in sun-synchronous polar orbits with nodal crossing times of 0530 (descending NPOESS), 0930 (descending METOP), and 1330 (ascending NPOESS) plus any residual satellites. To the extent practical, residual satellites may be maintained on-orbit on a non-interference basis for supplemental collection capability, operational back-up, test and evaluation, etc. Residual DMSP or POES spacecraft will be operated and managed in accordance with the Phase II C³ CONOPS.

3.2 Launch Support Segment.

The launch support segment will consist of all facilities and equipment necessary to launch NPOESS satellites with the exception of the launch vehicle system (booster).

3.3 C³ Segment.

This segment will consist of the ground-based elements which provide all functions necessary to maintain the state of health and to recover and distribute the data collected from the space segment. These elements include Satellite Operations Centers (SOCs), communication links and associated antennas.

3.3.1 Satellite Operations Centers (SOCs).

The SOCs perform the functions necessary for the operation of NPOESS and residual DMSP and POES satellites, and support to METOP satellites. The primary Satellite Operations Center for NPOESS will be located at Suitland, MD. A backup Satellite Operations Center will be located at Falcon Air Force Base (AFB), CO. The Falcon AFB SOC will be minimally manned but fully capable of performing all C³ functions (except Launch and Early Orbit (LEO) support) for the NPOESS as a backup to the Suitland SOCC. Primary C³ functions for the METOP mission will be performed by EUMETSAT from their SOC in Europe. Support to METOP will be provided by the Suitland and Falcon SOCs.

3.3.2 Communications Element.

Communication links are those elements of the C³ segment which provide the required connectivity to support command and control functions and primary data distribution services for all aspects of the NPOESS, METOP, and residual DMSP/POES programs. The NPOESS will use **TBD** circuits for communications support. Data exchanges with EUMETSAT and the METOP spacecraft will be conducted via **TBD** circuits.

3.3.3 Antenna Element.

The antenna element consists of the ground based equipment necessary to receive mission data and telemetry, and transmit up-link commands within and between the NPOESS segments. DoC/NOAA Command Data Acquisition (CDA) sites and Air Force Satellite Control Network (AFSCN) Remote Tracking Stations (RTS) will be used to communicate with the NPOESS. Residual DMSP/POES satellites will continue to use AFSCN and CDA sites, respectively. Primary communications with the METOP satellites will be performed through European antenna sites. The CDA sites will be used to communicate with the METOP (1 and 2) satellites in accordance with the international memorandum of agreement between the IPO and EUMETSAT. Communications with METOP 3 will be **TBD**.

3.3.3.1 CDA sites.

Communications with the NPOESS, METOP and POES satellites will be performed through the CDA sites at Fairbanks, AK and Wallops Island, VA. It is yet to be determined which antenna sites will be capable of performing NPOESS and METOP Mission Data Recovery (MDR).

3.3.3.2 AFSCN Remote Tracking Stations.

The AFSCN is utilized by many different government satellite programs. NPOESS will share time with these programs. NPOESS satellites will have the same priority within the AFSCN during Phase III as DMSP and NPOESS have under Phases II. The AFSCN will be operated and

maintained separately from the NPOESS program. Potentially available AFSCN sites are listed below. Antenna sites to be used for NPOESS and METOP MDR will be dependent on users' MDR requirements.

Thule, Greenland
New Boston, NH
Kaena Pt, HI
Vandenberg AFB, CA
Falcon AFB, CO
Anderson AFB, Guam
Oakham, United Kingdom
Mahe, Seychelles Islands
Diego Garcia Island, UK Indian Ocean Territory

3.3.3.3 Non-United States Government (USG) Sites.

The following non-USG site(s) may be used:

TBD - Tromsø, Norway
TBD - Kiruna, Sweden

These tracking stations will provide primary communication support with the METOP satellites but may also be used to supplement USG assets. Non-USG sites will not be critical for USG portions of NPOESS performance and NPOESS must meet system requirements without their support.

3.4 Interface Data Processor (IDP) Segment.

This segment is comprised of data processing equipment at the Central user and field terminal sites that are considered part of the NPOESS. The function of the IDP is to transform raw satellite data into IORD defined Environmental Data Records (EDRs) prior to delivery to users.

3.5 System Users.

Providing data to the users is the mission of the NPOESS. Customer service will take a very high priority. The integrated program supports two general types of users: the central users and the real-time users.

3.5.1 Central Users.

Central users are those processing centers within the USG that receive, process, and analyze DMSP, POES, METOP and/or NPOESS satellite data in combination with other data sources to generate weather, space, and environmental products. The DoD central users include: the Air Force Global Weather Central (AFGWC) at Offutt AFB, NE; the 50th Weather Squadron (50 WS), formerly the Air Force Space Forecast Center (AFSFC), at Falcon AFB, CO; the Naval Oceanographic Office (NAVOCEANO) at Bay St. Louis, MS; and the Fleet Numerical Meteorology and Oceanography Center (FNMOC) at Monterey, CA. The National Environmental Satellite, Data, and Information Service (NESDIS) will continue to provide data from its Suitland, MD facility to U.S. and international data centers through its established interfaces.

3.5.2 Real-Time Users.

Real-Time users are those users that receive DMSP, POES, METOP and NPOESS data as the satellites pass over that ground station. Available real-time transmissions from these operational satellites will include:

- NPOESS High Resolution Picture Transmission (HRPT)
- NPOESS Low Resolution Picture Transmission (LRPT)
- METOP HRPT and LRPT.
- Residual DMSP Real-Time Data (RTD) and Real-Time Data Smooth (RDS)
- Residual POES HRPT and Automated Picture Transmission (APT)

4.0 Operations.

4.1 Operational Functions.

Satellite operations, commanding, telemetry monitoring, mission scheduling, resource scheduling, launch and early orbit operations, and anomaly resolution for the NPOESS will be performed by the IPO. During Phase III, these functions will be primarily performed at the Suitland SOCC. The Falcon AFB SOC will be capable of performing mission planning for NPOESS while exercising back-up operations. Operations functions for METOP are **TBD**, but will include blind-orbit support and TT&C back-up. The following are the basic operational functions to be performed:

4.1.1 Satellite Command and Control.

Satellite command and control consists of state of health verification, satellite navigation and orbit determination, Mission Data Recovery (MDR), and other satellite commanding necessary to operate and maintain on-orbit satellites. Satellite command and control will routinely be exercised through the Suitland SOCC. The responsibility for NPOESS operation can be passed to the backup facilities if the Suitland SOCC becomes incapable of performing its function. The IPO/ADO, in coordination with the 50th Space Wing at Falcon, may direct operational control for all or part of NPOESS to be shifted to the Falcon AFB SOC for reasons both agencies feel necessary. Support for the METOP satellites may be transferred to the Suitland or Falcon SOC's in accordance with the Memorandum of Agreement between the IPO and the EUMETSAT.

4.1.2 Mission Planning.

Mission planning encompasses all actions necessary to schedule, program, and manage operations for each satellite. During Phase III, the Suitland SOCC will generate and disseminate all information needed for operation of the satellites. Schedules will be generated based on data collection and playback requirements of the central and real-time users. The IPO will establish procedures to ensure the C³ segment is responsive to users' special data and operational requirements. Mission planning files and programs will be transferred to the mission planning system at the back-up SOC as required to maintain a complete redundant capability.

4.1.3 Antenna Resource Scheduling.

The two SOC's will have the capability to interface with the AFSCN and CDAs to request and obtain support for tracking and MDR from NPOESS satellites. This function involves scheduling AFSCN and CDA antenna resources in support of satellite command and control and MDR. This

will be done via interfacing with the AFSCN Resource Scheduling Element and the Suitland SOCC. The Suitland SOCC will coordinate CDA support for NPOESS tracking and MDR. Support from non-USG antenna sites will be scheduled through **TBD**.

4.1.4 Launch and Early Orbit (LEO) Operations.

This function involves the unique satellite command, control, tracking, and anomaly resolution required when a satellite is initially deployed. Resources must be carefully scheduled to avoid launch support conflicts or interruptions to C³ requirements of other operational satellites. NPOESS spacecraft will attain operational status when the primary mission sensors are functioning nominally and mission data are being received by the central users as required. At that time, the new satellite will be turned over to control of the IPO. If the Suitland SOCC experiences a failure, control of operational satellites will be transferred to the back-up sites. LEO operations will be postponed until capability has been restored at Suitland.

4.1.5 Anomaly Resolution.

Satellites which are experiencing unique or unusual indications require anomaly resolution. Anomaly resolution refers to the non-routine procedures necessary to return a satellite to normal status. The IPO operations staff, in conjunction with the SOCs, will work closely with the IPO and contractor's system engineers to develop anomaly resolution procedures for the NPOESS spacecraft.

4.1.6 System Security.

All command and control transmissions from the NPOESS ground systems will be encrypted, using NSA approved algorithms, to ensure only authorized parties can control the system.

4.1.6.1 NPOESS Data Access.

Ordinarily, the NPOESS satellites will transmit mission data to central and real-time users without encryption. The NPOESS data encryption system will be designed to eliminate unnecessary redundancy and ensure only authorized users have access during periods of data denial.

4.1.6.2 Data Denial.

This function involves the transmittal of commands to the satellites to control/limit the access data to unauthorized users. During Phase III, the IPO/ADO will be responsible for implementing the NPOESS data denial capabilities. Data from the residual POES satellites will not be subject to data denial operations. Procedures will be developed to maintain the widest possible data distribution while exercising data denial operations to meet national security needs. The IPO will be the Controlling Authority responsible for validating user requests and authorizing distribution of COMSEC equipment, key material, and COMSEC aids to end users.

4.1.6.3 Data Denial Implementation.

The Memorandum of Agreement between the DoC, DoD, and NASA, as implemented by the NPOESS Operations Plan, describes NPOESS data denial policy and procedures. DoD may request NPOESS data denial for national security purposes in consultation with DoC and DoS.

4.1.6.4 COMSEC Support and Sustainment.

The Air Force Director of Cryptologic Management at Kelly AFB, TX will provide hardware logistics support for all ground COMSEC equipment and key management for COMSEC Material and COMSEC Aids to the NPOESS program, as established in MOA TBD.

4.1.7 Relay of Data to Central Users.

This function involves the communication of mission payload data to central data processing facilities. These facilities then process the data for use in generating forecasts and analysis of environmental parameters. Received data and the products generated by the central users can then be transmitted to customers around the world. Each SOC will be able to retrieve data from all suitably equipped CDA and AFSCN sites. The controlling SOC will ensure these data are delivered to meet all requirements of the central users. Central users will utilize the converged C³ structure to request data reshops, change data requirements, report problems, etc.

4.1.8 Spacecraft and Sensor Engineering.

The continuous monitoring of spacecraft systems, analysis of system status and performance, sensor calibration, and recommendation of command routines needed to maintain the spacecraft in peak health and to recover from spacecraft anomalies will be conducted at the SOC. Sensor calibration is done in close coordination with the central data processing facilities.

4.1.9 Threat Sensor Processing.

This function involves the processing of classified threat sensor information on the NPOESS platforms. (Final plans concerning these sensors have not yet been made.)

4.2 Suitland SOCC Operations.

The Suitland SOCC will be the primary SOC for NPOESS operations including residual POES and DMSP satellites. The polar program, to include personnel and equipment, at the Suitland SOCC will be managed by the IPO. The Suitland SOCC will also be equipped to provide blind-orbit support and TT&C backup to METOP satellites in accordance with international agreements. The Suitland SOCC will operate 24 hours a day, 7 days a week. During this time the Suitland SOCC will routinely exercise primary responsibility for C³ functions for NPOESS.

4.3 Falcon AFB SOC Operations.

The Falcon AFB SOC will provide NPOESS back-up capability and will utilize equipment and software identical to the Suitland SOCC's. This equipment will allow the Falcon AFB SOC to perform the core operations of NPOESS satellite command and control, MDR, mission planning, anomaly resolution, and antenna resource scheduling. The Falcon SOC will also be equipped to provide blind-orbit support and TT&C backup to METOP satellites (starting with METOP 3) in accordance with international agreements.

4.3.1 Standard Operations.

The Falcon AFB SOC will normally be staffed for operations during standard duty hours (for example, Mon-Fri 0730-1630). During this time the Falcon AFB SOC will routinely exercise its capability to perform satellite command and control, mission planning, and AFSCN resource scheduling for the NPOESS to maintain proficiency in these operational functions. These proficiency operations will be pre-planned and closely coordinated with the Suitland SOCC. Falcon AFB SOC NPOESS computers will remain on-line with the Suitland SOCC at all times. The 50th SW will ensure adequate manpower support 24 hours a day for this equipment.

4.3.2 Additional Support Operations.

The Falcon AFB SOC may provide additional support when launch and early orbit and anomaly resolution operations are occurring at the Suitland SOCC. This increased support could include shadowing Suitland operations or providing increased operational support to other satellites in the NPOESS constellation.

4.3.3 Primary Operations.

If primary operations for NPOESS transfers to the Falcon AFB SOC, the Falcon AFB SOC will be operated 24 hours a day, 7 days a week. If the transfer occurs during normal duty hours, the Falcon AFB SOC will be fully functional within 1 hour. If the transfer occurs outside of normal duty hours, the Falcon AFB SOC will become fully functional within three hours. The 50 SW will provide the Suitland SOCC a guaranteed means to contact Falcon SOC personnel 24 hours a day.

4.3.4 Extended Operations.

The Falcon AFB SOC will have sufficient staffing to perform all core operations for operational NPOESS satellites for 72 hours without augmentation. If the delay is expected to exceed this time, augmentees from the Suitland SOCC will deploy within 2 days to the Falcon AFB SOC. Augmentees will remain deployed until such time that the Suitland SOCC returns to functional capability. The Suitland SOCC manager or IPO Associate Director for Operations will coordinate with the commander of the 50th SW to ensure proper support for the augmentees.

4.4 Primary Operations Transfer.

Primary operations for NPOESS and/or residual satellites will transfer from the Suitland SOCC to the backup facility in the following circumstances:

4.4.1 Suitland SOCC Failure.

If the Suitland SOCC experiences a malfunction which precludes the SOCC's ability to assure transmission of mission data to either central or real-time users, the Falcon AFB SOC will assume primary operations for NPOESS until the Suitland SOCC regains the lost or failed capability.

4.4.2 Backup Augmentation.

NOAA personnel will perform the primary functions for NPOESS and residual POES/DMSP control under the direction of the IPO/ADO. The IPO Associate Director of Operations may task personnel from Suitland to deploy to the backup SOC at Falcon AFB or to the CDAs.

4.5 SOC Command and Control Interfaces.

The Suitland and Falcon SOC shall maintain a close interface with each other regarding the NPOESS. All satellite contacts performed by the Falcon AFB SOC will be pre-planned and closely coordinated with the Suitland SOCC.

4.5.1 Satellite Control Authority (SCA).

In order to prevent any confusion concerning SCA, only one SOC or CDA will control any given satellite at one time. The IPO will govern the transfer of SCA to and from each SOC or CDA.

The IPO may direct the transfer of SCA for any individual or group of satellites. Once SCA has been passed, the SOC or CDA gaining control of the satellite is responsible for all aspects of that vehicle's operation and mission. Only the SOC or CDA having SCA over a particular satellite or group of satellites may command and control those satellites. Mission planning, scheduling, data processing, etc. may be performed by another SOC or CDA in support of the SOC or CDA having SCA.

4.6 System User Operations.

The IPO/ADO will be responsible for the effectiveness of the C³ segment in providing data to the system users. Users will report problems concerning the receipt and quality of satellite data to the IPO using an adaptation of current reporting procedures, channels, and mechanisms. Any new procedures for NPOESS will be identified, coordinated, documented and disseminated to all users prior to implementation. The IPO will take action to resolve problems as soon as possible to meet Operational Availability requirements.

4.6.1 Central Users.

DoD and DoC central data processing facilities will be responsible for data processing and distribution of satellite data to their respective users. The IPO/ADO will supply the necessary on-site equipment and support (Interface Data Processing Segment) to deliver data to the central users in the appropriate formats.

4.6.2 Real-Time Users.

Real-Time users will be able to receive data and direct-broadcast messages from all operational satellites in the NPOESS constellation provided they have compatible receiving and processing equipment, cryptographic equipment for encrypted data transmissions, schedules or ephemeris, and communications frequencies. The SOC will also generate and issue satellite ephemeris and satellite orbital parameters to the real-time user community via conventional communications channels. Satellite ephemeris and orbital parameter messages sent via conventional communications channels will be formatted for automated data processing similar to messages currently issued by NESDIS for the POES.

4.7 Operational Support to Non-U.S. Systems.

The NPOESS will support and fulfill agreements with other countries. Support to EUMETSAT will consist of TT&C and blind orbit support to their METOP spacecraft. Additionally, EUMETSAT and the NPOESS IPO will arrange to share mission data in near real-time in accordance with international memorandum of agreements.

5.0 Personnel.

5.1 Integrated Program Office.

As described in the NPOESS IPO Staffing Plan, the IPO will be staffed by personnel from DoC, DoD, and NASA to form a unified entity capable of managing the NPOESS Program. Normal business hours for the IPO administrative office will be 0730 - 1700 Monday through Friday except holidays. However, appropriate IPO personnel will be on call to assist the SOC's, handle contingencies, and generally help ensure the operations of the programs under its control.

5.2 Suitland SOCC.

The Suitland SOCC will be operated by NOAA personnel 24 hours a day, 7 days a week. Sufficient personnel will be on hand for total NPOESS operations. The 50th Space Wing may have at least one liaison at the Suitland SOCC to support NPOESS operations.

5.3 Falcon AFB SOC.

The Falcon AFB SOC will be operated by the 50th Space Wing (SW). 50th SW personnel will not be assigned to the Integrated Program Office (IPO), but will serve the IPO as its operational customer in accordance with the Memorandum of Agreement between the IPO and the 50th Space Wing. The IPO may assign/detail one or more IPO representatives (liaisons) to the Falcon AFB SOC.

5.4 Training.

The Air Force and NOAA will use similar training procedures for their respective personnel. The IPO will ensure all personnel are provided the same level of initial training. Initial training will be conducted in accordance with the appropriate Implementation Plan and Memorandum of Agreement. Operations personnel will become qualified to support NPOESS and METOP satellites from both SOC's. Individuals will be selected from each SOC and trained to perform contingency functions (Falcon AFB SOC augmentation, national contingency operations) at other facilities.

6.0 Constellation Management.

Constellation management involves managing the health and status of the entire NPOESS constellation. The DoC and DoD will jointly share responsibility for constellation management via the IPO/ADO. Conflicts will be resolved by the IPO/SPD.

6.1 Constellation Sustainability Assessment.

The IPO's Associate Director for Operations will review NPOESS, POES, METOP and DMSP constellation status on a continuous basis and report such to the IPO/SPD on a weekly basis (or more often when necessary). Operational status, launch requirements, and launch readiness will be coordinated with US Space Command (USSPACECOM), Air Force Headquarters (HQ/USAF), the 14th AF, the National Weather Service (NWS), Air Weather Service (AWS), Air Force Space Command (AFSPC), the NOAA POES System Acquisition Office (SAO), Air Force Space and Missile Systems Center (SMC), the National Environmental Satellite, Data and Information Service (NESDIS), and the NASA METSAT Project. All aforementioned agencies will be responsible for informing the IPO/ADO of changes in NPOESS, DMSP, or POES status, launch requirements and launch readiness. The IPO/ADO and EUMETSAT will coordinate all activities and decisions relevant to METOP operations and planning. Based on this information, the IPO will provide NPOESS launch call recommendations and projections of future launches. Factors used to determine these projections and recommendations include, but are not limited to: sensor health status on each satellite, launch pad availability, launch vehicle assembly and checkout status, satellite processing facility availability, commercial launch agreements, launch support conflicts, and world political environment. Based on information from the IPO/SPD, the Senior User Advisory Group (SUAG) may request a launch through the AFSPC. Launch requests will include a 15 day launch window, nodal crossing time, and mission sensor complement. Launch requests will be thoroughly coordinated with all key agencies.

6.2 Launch Calls.

Following the launch requests from the SUAG, the US will issue all launch calls. They will direct the launch support segment, and launch facilities to prepare the vehicle for launch as negotiated with the IPO/ADO. Launch calls will be made on an as-needed (on-demand) basis. Normally an NPOESS launch will be scheduled to occur within 60 days of the launch call unless mitigating factors are considered sufficient enough to warrant the delay, or speedup the launch.

7.0 Security.

Systems and procedures will be developed to prevent the disclosure of mission plans, status, and information in accordance with established security guidelines. Security at the Suitland SOCC will follow DoC/NOAA security standards commensurate with that level necessary for NPOESS operations, equipment installed, classified materials present, etc. Security at the Falcon AFB SOC will follow DoD security procedures sufficient to meet the established requirements.

8.0 Maintenance.

C³ hardware and software maintenance procedures will be consistent with those detailed in the NPOESS Implementation Plan. Maintenance for any new acquisitions to support NPOESS will be funded through the IPO. Similar equipment at each SOC will be maintained under the same contract. Documentation will be created and maintained to ensure configuration management of hardware and software. AFSCN sites will be maintained separately under existing USAF contracts.

Acronym/Abbreviation List

ADO	Associate Director of Operations
AFB	Air Force Base
AFGWC	Air Force Global Weather Central
AFMC	Air Force Material Command
AFSCN	Air Force Satellite Control Network
AFSFC	Air Force Space Forecast Center
AFSMC	Air Force Space and Missile Systems Center
AFSPC	Air Force Space Command
AK	Alaska
APT	Automated Picture Transmission
ARTS	Automated Remote Tracking Station
AWS	Air Weather Service
C ³	Command, Control, and Communications
CDA	Command and Data Acquisition
CMP	Convergence Master Plan
CO	Colorado
COMSEC	Communications Security
CONOPS	Concept of Operations
DMSP	Defense Meteorological Satellite Program
DOMSAT	Domestic Satellite
DoC	Department of Commerce
DoD	Department of Defense
DoS	Department of State
EDR	Environmental Data Record
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FAFB	Falcon Air Force Base
FNMOC	Fleet Numerical Meteorology and Oceanography Center
FOC	Full Operational Capability
FSOC	Fairchild Satellite Operations Center
HRPT	High Resolution Picture Transmission
HQ/USAF	Air Force Headquarters
IDP	Interface Data Processor
IOC	Initial Operational Capability
IORD	Integrated Operational Requirements Document
IPO	Integrated Program Office
LEO	Launch and Early Orbit
LRPT	Low Resolution Picture Transmission

MDR	Mission Data Recovery
METOP	Meteorological Operational
METSAT	Meteorological Satellite
MOA	Memorandum of Agreement
MPSOC	Multi-Purpose Satellite Operations Center
MTPE	Mission to Planet Earth
NASA	National Aeronautics and Space Administration
NAVOCEANO	Naval Oceanographic Office
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NSA	National Security Agency
NSTC	National Science and Technology Council
NWS	National Weather Service
OSTP	Office of Science and Technology Policy
PBR	Playback and Record
POES	Polar-orbiting Operational Environmental Satellite
RDR	Raw Data Record
RDS	Real-Time Data Smooth
RTD	Real-Time Data
RTS	Remote Tracking Station
SAO	System Acquisition Office
SCA	Satellite Control Authority
SCC	Satellite Command and Control
SMD	Stored Mission Data
SOC	Satellite Operations Center
SOCC	Suitland Satellite Operations Control Center
SPD	System Program Director
SPO	System Program Office
SUAG	Senior User Advisory Group
TBD	To Be Determined
TT&C	Telemetry, Tracking and Commanding
USG	United States Government
USSPACECOM	US Space Command
VA	Virginia